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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED
DISTRIBUTION, NO. 48: FALSE CODLING MOTH

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Pest

FALSE CODLING MOTH
Cryptophlebia leucotreta (Meyrick)

Selected
Synonym

Argyroploce leucotreta Meyrick

Order: Family

Lepidoptera: Tortricidae

Economic
Importance

This species occurs widely in Africa south of the twentieth parallel where it is a pest of fruits of many plant species, especially citrus and cotton. In 1954, observations in orchards in eastern Transvaal, South Africa, showed infestations of about 5 percent in navel oranges and 2 percent in Valencia oranges (Gentry 1965, Stofberg 1954).

Peach has become prominent among the many other hosts, and infestation of this pest in peaches has increased because a number of new cultivars provide susceptible host fruits in summer. If the larvae are in a relatively late stage of development, infested fruits remain firm and may drop prematurely, but when picked from the tree, it is difficult to separate infested from uninfested fruit. For this reason even a small infestation of only 5 percent is intolerable if quality fruits are to be produced. Therefore, this pest endangers the peach industry (Daiber 1976).

At times this pest is an important pest of cotton in South Africa and Uganda, causing damage to partly grown bolls (Bredo 1933, Reed 1974).

Hosts

The false codling moth has a wide range of host plants and has adapted to cultivated crops from its original indigenous host plants. It particularly favors citrus of the cultivated crops, but also attacks many other deciduous, subtropical, and tropical plants (Economides 1979). The recorded hosts are Abelmoschus esculentus (okra), Abutilon spp. (jute), Ananas comosus (pineapple), Annona muricata (soursop), Annona reticulata (custard-apple), Averrhoa carambola (carambola), Bequaertiodendron magalismontanum (stamvrug), Calotropis procera (sodom apple), Camellia sinensis (tea), Capparis tomentosa (wig-'n-bietjie), Capsicum spp. (peppers), Catha edulis (khat), Ceiba pentandra (kapok), Citrus spp. (citrus), Citrus sinensis (navel orange, Valencia orange), Coffea spp.

(coffee), Coffea arabica (coffee), Cola nitida (cola), Combretum apiculatum (rooibos), Combretum zeyheri (raasblaar), Diospyros spp. (persimmons), D. mespiliformis (jakkalsbessie), Eugenia uniflora (Surinam-cherry), Ficus capensis (wild fig), Garcinia mangostana (mangosteen), Gossypium spp. (cotton), Harpephyllum caffrum (kaffir plum), Hibiscus spp. (mallow), Hibiscus cannabinus (kenaf), Juglans regia (English walnut), Litchi chinensis (litchi), Mangifera indica (mango), Musa X paradisiaca (banana), Olea europaea (olive), Pennisetum purpureum (elephant grass), Persea americana (avocado), Phaseolus spp. (beans), Phaseolus lunatus (lima bean), Podocarpus falcatus (yellow-wood berries), Prunus spp. (plums), Prunus armeniaca (apricot), Prunus persica (peach), Pseudolachnostylis maprouneifolia (kudu-berry), Psidium guajava (guava), Punica granatum (pomegranate), Quercus spp. (oak), Ricinus communis (castorbean), Royena pallens (bloubos), Schotia afra (boerboon), Sclerocarya caffra (marula), Sida spp. (sidas), Sorghum spp. (sorghums), Syzygium cordatum (water-bessie), Theobroma cacao (cacao), Triumfetta spp. (bur weeds), Vangueria infausta (wild medlar), Vigna spp., Vigna unguiculata (cowpea), Ximenia caffra (suurpruim), Zea mays mays (corn), Ziziphus jujuba (jujube), and Ziziphus mucronata (blinkblaar wag-'n-bietjie) (Gunn 1921, Hill 1983, Pinhey 1975, Reed 1974, Staeubli 1976, Willers 1979).

Citrus paradisi (grapefruit) and C. reticulata (tangerine) are less susceptible than other hosts. Larvae rarely develop in C. limon (lemon) (Economides 1979).

General Distribution

Commonwealth Institute of Entomology (1976) listed the following distribution in Africa for this pest, unless cited otherwise: Angola, Benin, Burundi, Cameroon, Central African Republic (Delattre 1978), Chad, Ethiopia, The Gambia, Ghana, Ivory Coast, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Reunion, Rwanda, Saint Helena, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland (Economides 1979), Tanzania, Togo, Uganda, Upper Volta, Zaire, Zambia, and Zimbabwe.

Characters

This pest is commonly called the false codling moth, because it closely resembles the codling moth, Cydia pomonella (Linnaeus), in appearance, habits, and type of damage; it does not, however, attack apples, pears, and quince, and it causes more noticeable premature drop of infested fruits than the codling moth (Gunn 1921).



Cryptophlebia leucotreta distribution map prepared by
Non-Regional Administrative Operations Office and Biological
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ADULTS (Fig. 1) - Length 6-8 mm (Cotton Pest Identification Manual) (Publication year unknown (s.a.)). Wingspan of 15-16 mm in males and 19-20 mm in females. Body brown, thorax with posterior double crest (Gunn 1921). Forewing mixture of plumbeous, brown, black and ferruginous markings, most conspicuous being blackish triangular pre-tornal marking and crescent-shaped marking above it, and minute white spot in discal area (Bradley, Tremewan, and Smith 1979). Male distinguished from female by its large, pale grayish genital tuft, large dense grayish white brush hindlegs, and deep semicircular pocket in hindwings (Gunn 1921).

Male distinguished from all other species by its specialized hindwing, which is slightly reduced and has a circular pocket of fine hairlike black scales overlaid with broad weakly shining whitish scales in anal angle, and its heavily tufted hind tibia (Bradley, Tremewan, and Smith 1979).

(Fig. 1)



Cryptophlebia leucotreta adult female, dorsal view (Courtesy British Museum (Natural History)).

EGGS - Translucent white at oviposition (color changes with time), 0.77 mm long, 0.60 mm wide, flat, oval (Daiber 1979a, Gunn 1921).

LARVAE - First instar larval length about 1.4 mm. Body white or creamy white, head and cervical plate brown to almost black. Some half-grown larvae with chitinized setal patches along dorsum very distinct, stippled or spotted design. Full-grown larvae shiny, smooth, length 15-18 mm (Stofberg 1948). Head light brown, wider than long. Ocelli 3 and 4 very close together. Spiracles round. Body pale with reddish hue, tubercles without or with faint pigmentation, with spines. Anal comb present (Williams 1953).

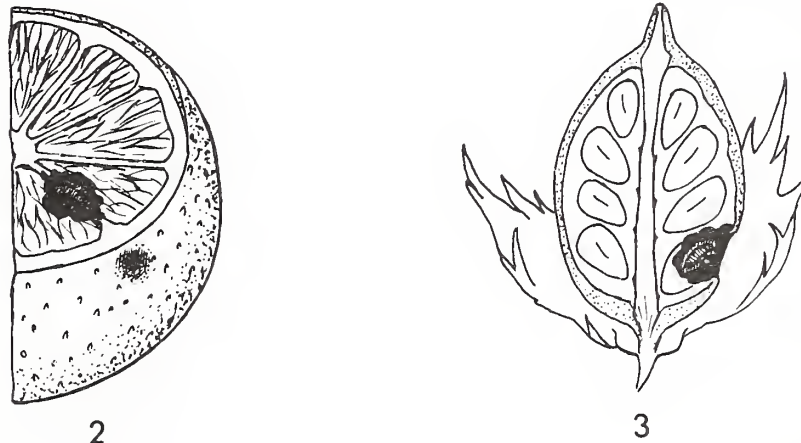
PUPAE - Length 8-10 mm, width 2-2.5 mm. Front raised, without depression on its ventral face. Dorsum of thoracic segment II heavily punctured. Legs of thoracic segment III extending to, but not beyond wing tips. Abdominal segment 2 with two rows of dorsal spines. Spines on abdominal segments 8 and 9 very well developed. Abdominal segment 10 with spines and two pairs of hooked setae (Williams 1953). Male pupae smaller, ninth abdominal segment with two ventral adjacent knobs in center. Female pupae larger, knobs absent (Daiber 1979c).

Characteristic
Damage

An orange infested by the larva of false codling moth shows a characteristic sunken brown patch on the skin, usually with a hole in the center (Fig. 2). Infested oranges become moldy through the development of fungal spores lodged in the larval entry hole. Larval activity causes premature ripening of the fruit and premature drop (Bradley, Tremewan, and Smith 1979, Gunn 1921, Pinhey 1975).

In cotton, the larvae mine in the wall of large green bolls, but later feed on the developing seeds (Fig. 3). Secondary bacterial infection and fungal rots frequently occur in the damaged tissues, and the larva is often found among rotting material. These bolls usually drop prematurely (Hill 1983).

(Figs. 2-3)



Cryptophlebia leucotreta larvae in damaged fruit:
2. Orange. 3. Cotton boll (From Hill 1983).

Detection
Notes

Most of the host fruits are prohibited entry into the United States from various foreign localities where this pest occurs, either because of C. leucotreta or for other pests and pathogens. Some prohibited hosts include Citrus fruit, peppers, guava, beans, mango, olive, and pomegranate. A few of the less commonly preferred hosts are enterable with or without treatment for fruit flies and with inspection for other pests including false codling moth. The movement of its hosts, fresh fruit, into the United States is regulated under Title 7, Part 319.56 of the Code of Federal Regulations.

The number of interceptions at U.S. ports of entry on fruits and vegetables for the past 12 years was as follows: Baggage 303, stores 17, cargo 8, and quarters 1. There were interceptions on Butyrospermum paradoxum (butterseed), Chrysophyllum cainito (star-apple), Cola acuminata, Cyphomandra betacea (tree-tomato), Dioscorea sp., Lycopersicon esculentum (tomato), Piper sp., Solanum melongena (eggplant), Synsepalum dulcificum (miraculous-berry), Vaccinium uliginosum, Vitis sp., and Yucca sp. These species are not recorded as hosts in the available references. Larvae were often intercepted in baggage from Ghana and Nigeria. Other interceptions were made from Angola, Cameroon, The Gambia, Ghana, Ivory Coast, Kenya, Malawi, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Upper Volta, Zaire, and Zambia. Interceptions were also made from Cape Verde Islands, Gabon, and Liberia, countries not recorded in the literature and may represent transshipments from other areas.

1. Look for eggs laid on the rind of fruit, foliage, and sometimes on twigs. If the eggs are laid during the week before harvest, a larval infestation may be expected at harvest (Daiber 1976).
2. Inspect mature or maturing fruit on or off the tree for spots, mold, or shrunken areas with 1-mm exit holes in the center.
3. Cut the fruit and search for larvae in the pulp. Infested fruits may appear undamaged externally.
4. Search for older larvae in open bolls and in harvested seed cotton. The larvae can complete their development on mature seeds, but neither eggs nor young larvae have been found in seed cotton (Reed 1974).
5. Watch for adults resting on the leaves and trunk during the day (Gunn 1921).
6. Surveys are best conducted during warm, wet weather when the population of this pest increases.

Biology

The adults become active at night, but during the day, they usually rest on the leaves and trunk (Gunn 1921). The female deposits 3-8 eggs per fruit (orange, peach) and as many as 800 eggs (average 456) over her lifespan at the optimum 25° C. Only one larva normally infests a fruit (Daiber 1980, Stoffberg 1954). Egg laying site differs with hosts. The eggs are laid singly on the rind of the citrus fruit (orange), sometimes on leaves and twigs, on large green bolls of cotton

(Hill 1983), and on the upper surface of leaves adjacent to mature or maturing peaches, sometimes on either the leaves on the lower surface or the twigs, but none on the peach itself (Daiber 1976). A few eggs are sometimes laid in overlapping groups (Hill 1983). With a drop from 25° C to 10° C, the preoviposition period lengthens from 1 day to 22 days, whereas the number of eggs produced decreases from an average of 456 eggs at 25° C to less than 1 egg at 10° C. The daily egg production at 25° C and 20° C peaks on the second and fifth day after adult emergence, whereas daily egg production at 15° C reaches a much smaller peak only on the twentieth day (Daiber 1980). The egg stage lasts 4-8 days in warm weather and 21-22 days in cooler weather (Daiber 1979a).

When the larva hatches, it wanders about the citrus fruit until it finds a suitable spot to gnaw through the rind. It then burrows about 1 mm in diameter into the fruit and eats the pulp, leaving masses of granular excreta at the point of entry (Gunn 1921, Smit 1964, Stofberg 1954). With most varieties of Citrus, the larva enters at any point, but in navel orange, the navel end is preferred (Hill 1983). On maturing peaches the larva freely enters punctures already present on the fruit (Daiber 1979b). The larva feeds on the flesh of the peach, mainly near the stone (Daiber 1976). On cotton, the young larva feeds almost entirely inside the boll wall. Later the older larva penetrates the inner septum and feeds on the developing seeds and lint. It can complete development on seeds in open bolls (Reed 1974). The larval stage inside the citrus fruit varies from 25 to 33 days in warm weather and 35 to 67 days in cooler weather (Stofberg 1954).

When full grown, the fifth instar larva leaves the citrus fruit through an exit hole and commonly drops to the ground to seek a pupation site or else emerges after the fruit has dropped from the tree (Economides 1979). Then it spins a cocoon of silken threads covered by soil or sand particles, invariably on the soil surface (Stofberg 1954). Under observations at Pretoria, South Africa, if a newly formed cocoon is covered with sand, the larva leaves the cocoon and moves towards the surface to form a new cocoon. The prepupa moults into a pupa. The pupa moves partly from the cocoon before the adult emerges, usually leaving the empty pupal skin attached to the cocoon (Daiber 1979c).

The average duration in the cocoon increased from 14 days at 25° C to 72 days at 11° C. Only some female moths emerge after 81 days at an average temperature of 10° C. In the laboratory, the number of adults emerging decreases when the cocoons are

exposed to a low humidity or when the soil on which the cocoons are kept is frequently irrigated. Emergence is slightly reduced when cocoons are covered with 20, 40, or 60 mm of soil. Initially, female moths emerge before male moths, but for a long period during emergence female and male moths emerge simultaneously (Daiber 1979c).

The average life span of males varies from 34 days at 15° C to 14 days at 25° C, that of females from 48 days at 15° C to 16 days at 25° C. On the average the female lives longer than the male (Daiber 1980).

The complete life cycle lasts 45-60 days in warm weather and 68-100 days in cool weather (Stofberg 1954). The duration of a generation depends on temperature. Under optimal conditions, the false codling moth can produce five generations a year in the Pretoria region. Under unfavorable conditions, however, only 2-3 generations may be produced (Daiber 1980).

Control

For citrus, orchard sanitation is one of the effective methods of control in South Africa. Infested fruit should be picked off the tree and collected from the ground at least twice a week and buried so that no larvae can pupate and develop into moths (Hill 1983, Smit 1964).

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